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The **Journal of the American Chemical Society** appears monthly, except during July and August. It will contain all papers read before the Society, as well as abstracts from American and Foreign Journals, and a list of American Patents relating to Chemical Industries.

The Price of Subscription is $5.00 per year, in advance.

The Meeting Room and Library of the Society are in University Building, Washington Square, New York.

The Regular Monthly Meeting is held on the first Friday of every month, at 8 P. M.

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Back numbers of the Journal are sold to Members at $3.00, to others at $5.00, per volume. Apply to the Librarian

WILLIAM RUPP, 97 Water St., New York.

The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, if application for the same be made when the article is sent.

Members are requested to give notice of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed to the Editor.

A. A. BRENEMAN, 97 Water St., New York.

THE ANNUAL MEETING.

The annual meeting of the society was held Friday evening, December 5th, 1890, in the University of the City of New York, Vice-President Breneman in the chair.

The minutes of the previous meeting were read and accepted. A letter was read from the retiring president, Dr. H. B. Nason. The Vice-President reported upon the state of the Society, and called attention to the increase in the membership, which had been over 30 per cent. in the past year. The treasurer's report, brought up to November 22d, was read by Treasurer King, and showed a similar improvement in the finances.

The Librarian reported that many books had been added to the library, and others bound, and that a list of the exchanges would be printed in the JOURNAL.

The report of the Committee on Papers and Publications, received through the Editor showed a marked improvement in the JOURNAL in every way, the yearly volume promising to be the largest ever issued.

The Committee on Conference which had been appointed in accordance with the resolution of the Newport meeting reported through Dr. Waller that Prof. Munroe had been obliged to resign. Prof. J. H. Appleton was appointed in his place. Dr. Waller thought it well to have the committee enlarged to five members. The matter was, on motion, placed in the power of the committee.

The Committee on Nominations reported through Dr. Doremus that it would be advisable to revise the By-Laws governing the admission of new members. It was voted to authorize the present committee on nominations to suggest the proper form of blanks and mode of procedure which it would be advisable to adopt.

The annual election was then held. Messrs. Geisler and Rupp were appointed tellers. The number of ballots cast was 61, resulting in the election of the officers for 1891, as follows :

President.

GEO. F. BARKER.

Vice-Presidents.

1. C. E. MUNROE,
2. C. F. CHANDLER,
3. A. A. BRENEMAN,
4. ELWYN WALLER
5. EDWARD HART,
6. F. A. GENTH.

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A. P. HALLOCK, C. A. DOREMUS,
J. B. MACKINTOSH.

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Advisory Council.

For three years:

C. F. CHANDLER, C. E. MUNROE,
T. G. WORMLEY, J. H. APPLETON.

For two years:

A. A. BRENEMAN, A. B. PRESCOTT,
F. A. GENTH, J. W. MALLETT.

For one year:

T. STERRY HUNT, H. B. NASON,
S. W. JOHNSON, G. C. CALDWELL.

The following gentlemen were unanimously elected to membership:

Jas. E. Talmage, Ph. D., J. A. Burns, Ph. D., S. G. Valentine, H. F. Carpenter, W. C. Ferguson, Ph.B., J. H. Washburn, Ph. D., Harry Mulliken, Dr. Edward P. Harris, H. S. Patterson, Nat. J. Lane, J. L. Perkins, J. A. Deghuee, J. J. Tobin, Harwood Huntingdon.

The following names were proposed:

ROBERT W. SCHEDLER, care of N. Y. Tartar Co., Ninth street and Gowanus Canal, Brooklyn.

J. W. BAIRD, Prof. Chemistry, Mass. Coll. Pharmacy, Boston, Mass.

JOHN B. LYNCH, M.D., Instructor in Histology, Coll. Phys. and and Surg., N. Y.

L. MEYER CONNER, City Chemist, Dallas, Texas.

WM. D. PHILLIPS, 77 Pine st., N. Y.

JEROME W. FRANK, Standard Varnish Works, 734 E. 14th st., N. Y.

For Associate Membership, Mr. J. H. Saville, Thomasville, Ga.

The society was then adjourned to meet in Philadelphia, December 30 and 31.

CHAS. F. McKENNA.
Recording Secretary.

THE PHILADELPHIA MEETING.

The second general meeting of the American Chemical Society was held at Philadelphia December 30 and 31 as announced.

Eighty chemists were registered at the meeting. The meeting was opened with a short informal address by Prof. H. B. Nason, President of the Society. Prof. G. F. Barker, President of the Society for 1891, presided at the second session, and delivered an inaugural address upon "The Borderland between Physics and Chemistry."*

Twelve papers were read at the meeting. A conference of committees from different chemical organizations was held, and resolutions were adopted recommending the union of all American chemists in one body under the Constitution of the American Chemical Society, with such modifications as may be hereafter agreed upon. A further conference was recommended.

A full report of the Philadelphia meeting will appear in the January number of the *Journal*.

* This address will be printed in full in the January number.

NOTES ON CERTAIN REACTIONS FOR TYROTOXICON.

By H. A. Weber, Ph. D.
(*Prof. Agricult. Chem. Ohio State University, Columbus, O.*)

Through the Ohio State Board of Health and the Ohio State Dairy and Food Commission the writer has, within the last few years, received numerous samples of poisonous cheese for examination. The samples were tested for tyrotoxicon according to the well known method as published by Dr. Vaughan. About 1,500 grammes of the cheese was cut up into small cubes, placed into a percolator, covered with distilled water and allowed to digest at ordinary temperatures for several hours. The aqueous extract was then withdrawn and more water added, a little at a time, until about one litre of percolate was obtained. This was rendered alkaline with sodium carbonate, extracted with half its volume of Squibb's ether and the ether allowed to evaporate spontaneously. After complete evaporation of the ether the aqueous residue was subjected to the following tests:

One drop was added to a mixture of ferric chloride and potassium ferricyanide. In all cases an immediate precipitate of prussian blue was formed.

One or two drops were added to a mixture consisting of a few drops each of carbolic acid and strong sulphuric acid. A reddish-yellow coloration ensued in all cases. On standing for several hours this color changed to permanent violet.

The remainder of the aqueous residue was, at a single dose, given to a small kitten. In no case could any ill effects be observed. Since tyrotoxicon has been shown by Dr. Vaughan to be such an active poison, and since the physiological test in all cases examined by the writer have been signal failures, it was concluded

that the reactions mentioned above must have been due to other causes. In looking for these causes, it was found that commercial butyric acid could be made to produce both reactions in a satisfactory manner, as will be seen from the following tests:

A single drop of the butyric acid produced only a slight formation of prussian blue when added to a mixture of ferric chloride and potassium ferricyanide. With a single drop of the butyric acid, the carbolic acid reaction was very marked, the mixture immediately turning bright orange red, and changing to dark violet on standing.

One-half cubic centimetre of the butyric acid was mixed with 50 c. c. of water and filtered. The filtrate was rendered strongly alkaline with sodium carbonate, extracted with ether and the ether was allowed to evaporate spontaneously. The aqueous residue gave both reactions with marked distinctness.

Again, the last sample of cheese examined was allowed to remain in the percolator. The bottom of the percolator was corked, the cheese covered with distilled water and the mouth of the percolator covered with a glass plate. After standing four or five days further, decomposition had set in. The aqueous extract was then withdrawn and filtered. The filtrate was alkaline and had an offensive odor. It was placed in a flask connected with a condenser and a portion distilled over. This was done to destroy any tyrotoxicon that might have been present. The distillate was very alkaline and had a strong, sickening odor of herring brine, probably due to trimethylamine. From this distillate both reactions were obtained, the prussian blue reaction being especially marked.

The residue left in the flask was removed, acidulated with sulphuric acid and filtered. The filtrate was again subjected to distillation. The distillate was acid and had a strong odor of butyric acid. It gave no prussian blue reaction and only a faint one with carbolic acid. A portion of this distillate was rendered alkaline with sodium carbonate and extracted with ether. The residue gave no reaction whatever with carbolic acid, owing evidently to the fact that the sodium butyrate is insoluble in ether. The remainder of the acid distillate was then mixed with the alkaline distillate obtained above. The mixture was rendered alkaline

with sodium carbonate and then extracted with ether. The aqueous residue now gave both reactions very distinctly.

From these experiments it may be inferred:

1. That the prussian blue reaction is caused by the presence of an organic base, probably an amine.

2. That the carbolic acid reaction is due to butyric acid.

3. That, when both bodies are present in the same liquid both are extracted with ether from an alkaline solution, probably in the form of a butyrate of the organic base.

4. That both bodies are liable to occur in any old specimen of cheese, milk or cream.

5. That the presence of there two bodies causes artificial diazobenzole to give the orange red reaction with carbolic acid, after being extracted from whey with ether, which it does not give before.

THE RELATIVE MERITS OF THE WANKLYN AND THE ADAMS METHODS IN THE ESTIMATION OF FAT IN MILK ANALYSIS.

By Joseph F. Geisler.

The enactment of laws regulating the quality of milk necessarily involves the adoption of minimum limits or standards. The analytical methods used to ascertain the data must be practical and accurate, and must not involve too great an expenditure of time. Since the adoption of milk standards, especially the minimum limits as to solids and fat, many methods of more or less merit have come into use. The method of Wanklyn, with slight modifications, has been most generally adopted, and in fact has served in determining the standards in many countries. Up to the time of the introduction of the Adams or *coil method*, it was generally considered that the Wanklyn method, and the gypsum or sand methods, gave sufficiently accurate results for all practical purposes. This opinion is still retained by some chemists. The extensive introduction of the coil method and the exhaustive investigations by the Society of Public Analysts in England called attention to great discrepancies between the per cents. of fat ascertained by the coil method and those determined by other methods. It has been generally supposed that the Adams method would usually extract 0.2 to 0.4 per cent. more fat than could be found by the Wanklyn method.

Those who have had experience in the analysis of a great variety of milk and who have made comparative tests by the different analytical methods, have probably obtained differences greater than these.

Having made many such comparative analyses I present herewith some of the analytical data obtained in the analysis of both pure and adulterated milk.

THE WANKLYN METHOD.

In this method about five (5) cubic centimetres of milk are accurately weighed in a tared platinum (flat bottomed) dish and then dried at a temperature of 100° C. to practically constant weight. The dry residue is then exhausted by repeated portions of boiling ether, or petroleum ether, and the extracted fat weighed direct or by difference, *i. e.*, loss in weight of the dry residue first obtained. Carefully worked the duplicate determinations of the per cent. of fat agree well with each other. Unless the dry residue be thoroughly broken up with a glass rod during the treatment with ether the results are, at times, liable to fall considerably below the truth, as will be shown in the comparative analyses cited below.

The platinum dishes used are usually of $1\frac{5}{8}$ inches diameter at the base, or the bottom presents about 2 square inches of surface over which the milk solids forming the dry residue are distributed. There are many reasons for the opinion that the fat cannot all be extracted from such a residue by a solvent without first breaking up the residue mechanically. Quite a number of circumstances may influence the results obtained. Milk is extremely variable in composition. Not only does the fat vary widely in percentages, but the other contstituents, and the relative proportions of these to one another, may also vary considerably at times. These, together with the fact that there is considerable difference in the size of the fat globules of the milk of different breeds of cows, are the main causes. It must be quite generally known to those who handle milks to any extent that the individual fat globules of the milk of Jersey cows are considerably larger than those of the milk of Holsteins. For this reason the cream from the milk of the former rises much more quickly and perfectly. This illustration applies to other milks as well. During the evaporation of the milk in the flat bottomed platinum dish the bulk of the fat rises to the surface and forms a layer from which the fat is easily dissolved by the given solvent. The more perfect the initial separation, the more complete and perfect will be the subsequent exhaustion on the application of the proper solvents. There is, however, good reason to believe that in some milks, owing to peculiar combinations of conditions, considerable fat is retained in the

dry residue, so completely incased in the hardened sugar and casein that it is impossible for the solvent to get at it in this condition. Such a residue when pulverized will frequently be found to yield 0.3 to .4 per cent. more fat.

That there is great variation in the time required for the cream to rise in different milks is a fact quite well known. In the author's experience a sample of milk was brought to him as a skimmed milk having shown but very little cream by the cream test. The sample upon analysis was found to contain over 4 per cent. of fat.

THE ADAMS OR COIL METHOD.

In this method many mechanical difficulties are overcome and the data obtained answer all requirements as to accuracy. The method is used principally in the estimation of *fat*. It is a vast improvement over the Wanklyn and similar methods inasmuch as the milk solids are distributed over so large a surface that the solvents used are enabled to extract *all* the fat. The method is, briefly, as follows:

White demy blotting paper, mill 428, weighing about 38 pounds per ream is cut into strips 22 inches long and 2½ inches wide. Each strip is rolled into a loose helical coil having a diameter a little less than an inch. The coils must be exhausted with ether and finally dried at 100° C.

"The milk to be examined is shaken, and with a pipette, 5 c.c. are discharged into a small beaker 2 inches high by 1¼ diameter, of a capacity of about 30 c.c., weighing about 12 grams. This charged beaker is first weighed, and then a paper coil gently thrust into the milk very nearly to the bottom. In a few minutes the paper sucks up nearly the whole of the milk. The paper is then withdrawn by the dry extremity of the coil and gently reversed, and stood dry end downwards on a clean sheet of glass. With a little dexterity all but the last fraction of a drop can be removed from the beaker and got upon the paper. The beaker is then again weighed, and the milk taken estimated by difference. It is of importance to take up the whole of the milk from the beaker, as I am disposed to consider that the paper has a selective action, removing the water constituents of the milk by preference over the fat.

"The charged paper is next placed in the water oven on the glass plate, milk-end upwards, and roughly dried. Mismanagement may possibly cause a drop to pass down through the coil on to the glass. This accident ought never to occur, but if it does, it is revealed in a moment by inspection of the surface of glass, and the experiment is thereby lost. In about an hour it is rough-dried and in a suitable condition for the extraction of the fat."

Many modifications have been introduced but only in minor details. Some chemists use a different filter paper, others use asbestos fibre or asbestos paper. The use of coils of a good quality of filter paper has the advantage of exposing comparatively a very large surface over which the dry milk solids are distributed and thus exposed to the action of the solvent. A paper $22\frac{1}{2} \times 2\frac{1}{2}$ inches has at least $56\frac{1}{4}$ sq. in. surface, or $112\frac{1}{2}$ sq. in. for the two sides, as the smallest surface exposed. When it is further considered that the milk is distributed over the individual fibers of the paper it is at once seen that the surface is still more increased. It is probable that the surface thus exposed in a coil ranges from 300 to 400 square inches. This large surface enables the complete extraction of the fat in the shortest possible time.

I have preferred to modify the details somewhat as follows:

The coils* are prepared from Schleicher & Schüll's filter paper No. 597, the strips cut to the usual size $22\frac{1}{2} \times 2\frac{1}{2}$ inches. The coils are thoroughly exhausted by repercolation with hot ether, and when necessary also with hot alcohol, until all soluble matter has been extracted, then dried and kept ready for use. For an analysis a coil is unrolled, the edges turned up about $\frac{1}{4}$ inch for the full length of the strip, and then, by suitably fastening the ends, it is hung up at an angle of about 45 deg. Into a small tared beaker of about 18 c.c. capacity, about 6 c.c. of milk are accurately weighed and then immediately transferred to the inclined strip by gradually dropping the milk upon the same. The beaker and glass rod are then wiped dry with a small piece of filter paper and this is hung up with the strip. In this manner with a little care

* S. & S. now manufacture specially for milk analysis a grade of paper, No. 571, which is guaranteed free from fat.

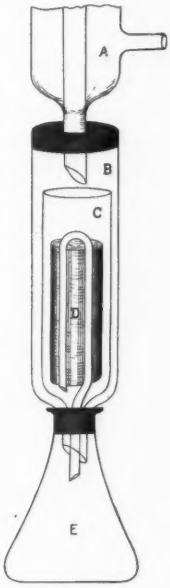
not a particle of the weighed quantity of milk taken need be lost. The coil, before the milk is transferred to the same, is marked with a number agreeing with the number of the milk sample so that it can be indentified. It is then hung perpendicular and allowed to hang for 1 to 3 hours until dry, finally rolled into a loose coil and transferred to an air bath and dried at 100° C., for about ¾ hour to 1 hour or until thoroughly dry. The coil is then transferred to a repercolation apparatus having an intermittent syphon in which the constant repercolation of the ether extracts all the fat from the coil.*

When the extraction is complete the coil is removed, the ether recovered, and the residual fat remaining in the tared flask first dried a few minutes on the water bath, the flask wiped off clean and dry, transferred to an air bath, dried at 100° C. for 20 to 30 minutes, and, after cooling 10 to 15 minutes, weighed. To ensure accuracy it is well to dry the flask a second time for about 20 minutes and reweigh as before.

The washed ether used for such extractions must be redistilled or tested, to make sure that it does not yield any residue, which would otherwise be calculated as fat. A suitable size of extraction apparatus is described herewith.

*It is best to cover the top of the coil with a small piece of exhausted filter paper so as to prevent the condensed ether from mechanically removing particles of the solidified material from the coil.

EXTRACTION APPARATUS.*



A. Liebig Condenser.

B. Percolator. Diameter (int.) 1½ inches; Length of body, 6½ to 7 inches. Lower stem about 2 inches long, cut off obliquely, and not less than ⅜ inches int. diameter.

C. Extractor. Length of body, 4¼ to 4½ inches, internal diameter, 1 inch. Lower stem about 3 inches long, and cut off obliquely. Internal diameter of lower stem and intermittent syphon, about ⅛ inch. Height of syphon, 3¼ to 3½ inches, with inner end, which must reach to near the bottom of the extractor, cut off obliquely.

D. Coil of paper.

E. Erlenmeyer Flask. Flask about 4 inches high, wide neck, and measuring about 150 c. c.

* Although this apparatus was designed by the author, he makes no claim as to originality of the same.

Analytical Data.

The following analyses were made by the "Wanklyn" method. In the series *A* petroleum ether was used for the fat extraction and in the duplicates, series *B*, purified ether. It will be observed that there is no material difference in the percentages of fat obtained, so that either answers equally well as a solvent.

A	No. 1.	*B*, duplicate
Spec. Grav. at 15.5° C.	—1.0261—	
Water	89.442%	89.446%
Total Solids	10.558%	10.554
	100.000%	100.000
Fat	3.056	3,038
Casein and Sugar	6.931	6.924
Ash	.571	.592
Total Solids	10.558%	10.554%
	No. 2.	
Sp. Gr. at 15.5° C.	—1.030—	
Water	88.518	88.527
Total Solids	11.482	11.473
	100.000	100.000
Fat	3.243	3.240
Casein and Sugar	7.582	7.568
Ash	.657	.665
Total Solids	11.482%	11.473%
	No. 3.	
Sp. Gr. at 15.5° C.	—1.025—	
Water	89.240	89.227
Total Solids	10.760	10.773
	100.000	100.000
Fat	3.588	3.488
Casein and Sugar	6.572	6.678
Ash	.600	.607
Total Solids	10.760%	10.773%

In the above fat determinations, as well as all the following fat estimations by the "Wanklyn method," a glass rod was used to

break up somewhat the hardened residue. From the above duplicate analyses it is quite evident that the duplicate estimations of solids and fat agree well with each other. The use of a glass rod to break up the hardened residue is ruinous to the platinum dishes, and unless that device is resorted to the "total" extraction of the fat is impossible. It has been found that the milk residues, which have been exhausted by merely pouring ether upon them, heating to boiling, pouring off and repeating the operation until the ether fails to extract anything further, still contain fat. This has been demonstrated by pulverizing such a residue and again submitting it to the action of ether.

In the following table of analyses of a miscellaneous lot of milks the estimation of the fat was duplicated by the *coil* method.

Sp. Gravity.	% Water.	% Total Solids.	% Casine & Sugar.	% Ash.	% Fat. "Wanklyn" method.	% Fat. Coil method.	Dif. in % of Fat.
1.0286	88.744	11.256	7.503	.635	3.118	3.35	+.24
1.0290	89.004	10.996	7.425	.616	2.955	3.14	+.19
1.0273	89.194	10.806	7.062	.585	3.159	3.24	+.08
1.0274	88.771	11.229	7.329	.623	3.277	3.61	+.33
1.0257	89.917	10.083	6.832	.588	2.663	3.01	+.35
1.0289	89.160	10.840	7.521	.651	2.668	2.93	+.26
1.0257	89.791	10.209	7.007	.560	2.642	3.14	+.40
1.0264	89.06	10.94	7.004	.582	3.354	3.57	+.22
1.0330	87.192	12.808	8.655	.710	3.443	3.71	+.27
1.0285	88.509	11.491	7.375	.674	3.442	3.57	+.13
1.0290	88.663	11.337	7.602	.623	3.112	3.34	+.23
1.0288	88.568	11.432	7.415	.682	3.332	3.44	+.11
1.029	89.036	10.964	7.258	.695	3.011	3.14	+.13
1.030	89.255	10.745	7.953	.692	2.100	2.69	+.59
1.0248	88.628	11.372	6.701	.588	4.083	4.28	+.20
1.02919	88.180	11.820	7.875	.595	3.35	3.76	+.41
Duplicate	88.210	11.790	7.863	.587	3.34		
1.0270	85.883	14.117	7.297	.589	6.231	6.310	+.08
Sp. G. not taken	88.407	11.593	7.813	.670	3.110	3.71	+.60
1.0332	87.012	12.988	9.050	.738	3.200	3.79	+.59
1.0245	88.839	11.161	6.846	.595	3.720	4.16	+.44

In the above analyses of 20 milks the average difference amounts to +.294% in favor of the coil method, with the differences ranging from +.08% to +.60%. In the following 5 samples recently analyzed in duplicate by both the Wanklyn and *coil* methods the results were as given below. It must be noted, however, that in these fat determinations by the Wanklyn method the dry residues were not manipulated with a glass rod to any extent, but the fat was "exhausted" by repeated application of boiling ether until the latter failed to extract any more fat. All are the average of duplicate determinations.

Water.	Solids.	Ash.	Wanklyn. Fat.	Coil. Fat.	Difference in % Fat.
87.420	12.580	.753	3.359	3.816	+.457
87.905	12.095	.765	2.905	3.625	+.720
87.102	12.898	.734	4.125	4.707	+.582
87.554	12.446	.750	3.398	3.806	+.408
88.226	11.774	.730	3.030	3.602	+.572

The coil method extracted in the five samples an average of .547% more fat than the Wanklyn, the range being from .408 to .720%. Such differences certainly deserve recognition.

The following investigations were made with a view of determining the merits of some of the objections raised against the *coil* method.

Amount of Substances Soluble in Ether.

A paper coil, not previously exhausted by ether, submitted to continuous repercolation in the extraction apparatus for four hours, yielded a residue amounting to 0.008 g., which figured on basis of 6 grms. of milk would have shown a maximum increase of .13% apparently, fat. In another lot of paper (Schleicher & Schülls, No. 597) the *average* of 16 coils amounted to 0.0025 g. per coil, which on the above basis of 6 grms. would show an apparent increase of .041%.

Rate at which the Fat is Extracted.

The milk used for this series of tests had the following composition :

	Water.	Total Solids.	Fat.	Cas. and Sugar.	Ash.
(Sp. Gr. 1.0274)....	87.847	12.153	4.294	7.163	.696

The coil used was previously exhausted by both ether and alcohol.

Total ether used=40 grms.	Milk taken=6.073 grms.	
13 syphonings yielded	0.2608 grms. fat	=4.294 % fat.
6 additional syphonings yielded	0.0003 " "	=0.004 % "
6 " " "	0.0000 " "	=0.0 "
		4.298 % fat.

In this case, therefore, thirteen syphonings extracted practically all the fat, and the additional twelve syphonings yielded scarcely a weighable quantity of anything, which goes to show that the ether does not extract any appreciable quantity of milk sugar, or milk constituents other than fat. In a number of cases where the coil method seemed to give very high results as to per cent. of fat, the residues of "fat" in the flask were completely soluble in petroleum ether.

Effect of Dropping or Absorption in the transfer of the Milk to the Coil for the Extraction of Fat.

A pure milk was used for this test:

	Water.	Total Solids.	Fat.	Cas. & Sug.	Ash.
(Sp. Gr. at 155°C.=1.0315)	86.376	13.624	4.540	8.320	.764

% Fat yielded when milk was absorbed in coil as per Adams..... =4.550
% Fat yielded when milk was dropped upon the unfurled strip.... =4.530

It is thus seen that the difference here amounted to only 0.020 %, considerably within the limits of experimental error.

Does the Fat Oxidize during the Drying?

Some have tried to account for the increased yield of fat by the coil method by attributing it to oxidation of the fat. Direct experiments fail to prove this, and in fact show that if oxidation does take place it is not appreciable under the conditions of the test. A sample of pure milk was taken for the test:

COMPOSITION.

	Water.	Total Solids.	Fat.	Cas.& Surg.	Ash.
(Sp. Gr. at 15.5°C.=1.033)	86.969	13.031	3.864	8.417	.750

Of this milk three different portions were weighed, transferred to the coil paper as usual by dropping and each treated further as indicated below.

The coils, previous to pouring the milk upon the same, had been extracted with ether and alcohol and dried as usual.

A. The strip with milk hung up and air dried at the temperature of the atmosphere, about 22° C. for 3 hours.

B. Dried in open air with the heat from a burner at a temperature of 40° to 55° C. for 4 hours.

C. First dried same as *B*, but in addition thereto 3½ hours at 100° to 103° C. in an air bath.

If the fat is oxidised during the drying, it is reasonable to expect that the longer the drying and the higher the temperature the greater will be the amount of oxidation and the apparent increase in the percentage of fat obtained. The following data were obtained :

	Milk taken.	Fat obtained by Syphoning.	% Fat.
A	5.8875 g.	0.2285 g.	=3.881 %
B	6.0325	0.2327 g.	=3.859 %
C	6.089	0.2347 g.	=3.854 %

Test *C*, which was subjected to the most thorough drying, gave 0.027 % less fat than *A*, and .005 % less than *B*, all of which are within the limits of experimental error. There is, therefore, no evidence that any increase in fat was caused by oxidation, in fact according to the above data the reverse would be the case. It was also found that drying the fat contained in the Erlenmeyer flask in the air bath for 30 to 45 minutes did not give any evidence of oxidation of the fat.

INFLUENCE OF THE EXHAUSTION OF THE COILS BY ETHER AND ALCOHOL.

For this purpose coils (S. + S. 597 paper) were prepared by exhausting them for 2 hours in the repercolation apparatus and then dried = "ether" coils.

Some of the "ether" coils were then exhausted by repercolation with hot alcohol and dried = "alcohol" coils.

The milk used in the first series had the following composition :

	Water.	Tot. Solids.	Cas. & Sugar.	Fat.	Ash.
(Sp. Gr. at 15.5 % = 1.0318)	87.155	12.845	8.195	3.890	.760

		Milk taken.	Fat obtained.	% Fat.	Average.
"Ether" Coils	No. 1	6.178g	0.2414g	= 3.907 %	3.917 %
	No. 2 duplic.	6.017g	0.2363g	= 3.927 %	
"Alcohol"	No. 3	6.045	0.2337g	= 3.866 %	3.864 %
	No. 4 duplic.	6.004	0.2319g	= 3.862 %	

Average difference = .053 %

The milk for the second series contained :

	Water.	Tot. Solids.	Cas. & Sugar.	Fat.	Ash.
(Sp. Gr. at 15.5 % = 1.0312)	87.152	12.848	7.928	4.181	.739%

		Milk taken.	Fat obtained.	% Fat.	Average.
"Ether" Coils	No. 5	6.000	0.2509	= 4.181 %	4.197 %
	No. 6 duplic.	6.0635	0.2555	= 4.213 %	
"Alcohol" Coils	No. 7	6.1195	0.2524	= 4.124 %	4.152 %
	No. 8	5.946	0.2486	= 4.180 %	

Average difference = .045 %

A comparison of the above data will show the fact that coils prepared from S. & S. filter paper No. 597 and thoroughly exhausted by ether answer for all practical purposes, the difference of .045 % and .053 % as above obtained being quite insignificant. As already stated each lot of paper must be tested to guard against error.

I append herewith a number of results of duplicate estimations of fat by the coil method.

% Fat Miscellaneous Milk		% Fat Skimmed Milk	
a.	b. duplicate.	a.	b. duplicate.
		0.345	0.343
3.831	3.855	0.319	0.351
3.828	3.847	0.305	0.302
3.691	3.604	0.502	0.505*3
3.876	3.842	0.484	0.508*3
2.801	2.776*1	0.672	0.694
5.342	5.394*2	0.601	0.568

*1 An adulterated milk.

*2 A pure sample of milk from a herd of 6 cows fed on some bran and pasture. The analysis of the milk showed

Water.	Total Solid.	Fat.	Cas. & Sug.	Ash.
85.838 %	14.162 %	5.368	8.058	.736

This milk was very high colored, owing to the richness in fat. The Sp. Gr. of the milk at 15.5° C. was found to be 1.0305.

*3 In these skimmed milks the Wanklyn method failed to show more than .15 % fat.

SUMMARY.

In the data presented most of the data are stated with three decimal figures. It is almost needless to add that beyond the second decimal the figures have but little practical value except in making up averages, but the figures were here retained so as to agree with the data of other tables in which some of the results had to be used.

Attention should also be called to the distinction between the terms—"Wanklyn" and—Wanklyn—method as used thoughout the article. In the "Wanklyn" method the dry milk residues were more or less broken up by means of a glass rod, while in the —Wanklyn method no particular attempt is made to mechanically break up the residue during the action of the solvent.

As to the relative merits of the Wanklyn and Adams, or coil method, for the extraction of the fat of milk it must be conceded:

(1) That the duplicates by either method agree well with each other.

(2) That the Adams' or coil method may yield as much as 0.72, per cent. more fat than the Wanklyn method, the variation, depending much upon whether or not the dried residue of milk solids in the Wanklyn method is mechanically broken up during the action of the solvent.

(3) That the *ratio of fat extracted by the Wanklyn method* (or similar methods) *does not bear a uniform ratio to the total percentage of fat contained in the milk*, which fact in itself is sufficient to condemn the method where accuracy is required.

Milk analyzed by the Adams' or coil method should be required to show at least 0.35 per cent. more fat than the standard adopted for the Wanklyn method. From the fact that the coil method extracts more fat than the Wanklyn method it is evident that by the former the "solids not fat" will be found to be lower, frequently as low as 8.5 per cent. In several instances in the pure milk of cows fed on grass pastures the "solids not fat" were found as low as 8.30 to 8.00 per cent.

Although the *average* difference between the Wanklyn and the Adams' (or coil) method may be considered as 0.3 to 0.5 per cent., yet it must be borne in mind that *averages* cover up a multitude of sins and that it is the extremes we must guard against.

ABSTRACTS.

ANALYTICAL CHEMISTRY.

Analysis of the Barium Group. By DR. C. LÜDEKING.

The author finds that in the customary test with calcium sulphate solution for barium and strontium, considerable quantities of these may be overlooked. The limits of precipitation may be seen in the following table:

Quant. of Chloride.	Dissolved in Water c. c.	Reagent.	Remarks.
1. 0.003g Ba	2 c. c.	1 c. c. $CaSO_4$ sol.	Definite precipitation.
2. 0.002g Ba	2 c. c.	" "	Precip. only after standing some time.
3. 0.001g Ba	3 c. c.	1 gtt. K_2CrO_4 sol.	Precipitate.
4. 0.020g Ba 0.986g Ca	4 c. c.	1 c. c. $CaSO_4$ sol.	No precipitate.
5. 0.003g Ba 0.986g Ca	2 c. c.	3 c. c. Sod. Acetate sol. 2 c. c. $K_2Cr_2O_7$ sol.	No precipitate in cold, but after boiling.
6. 0.010g Ba 0.986g Ca	13 c. c.	1 c. c. $CaSo_4$ sol.	No precip. Precip. on addition of K_2CrO_4
7. 0.001g Sr	2 c. c.	1 c. c. $CaSO_4$ sol.	No immediate precip. on boiling. Precip. after 15 minutes.
8. 002g Sr	2 c. c.	1 c. c. $CaSO_4$ sol.	Immediate precip. on boiling.

Calcium chloride was found to interfere very much with the precipitation of strontium by $CaSO_4$ solution.

A solution containing 30% of $SrCl_2.6H_2O$ is precipitated by $CaSO_4$ solution in the cold.

Under favorable conditions the author considers .1% $BaCl_2$ and .06% $SrCl_2$ the limits by the calcium sulphate test, while potassium chromate will give a distinct precipitate with a solution containing only .03% of $BaCl_2$. The reactions are much less delicate when considerable quantities of strontium or calcium chloride are present. It is therefore recommended that the precipitated carbonates of the barium group, after careful washing, be dissolved in acetic acid, and the solution tested with potassium bichromate solution,* heat if necessary. If a precipitate forms, filter. Examine the precipitate for barium. The filtrate is neutralized with NH_4OH, precipitated by ammonium carbonate, washed, dissolved in hydrochloric acid and tested for strontium by the spectroscope. Separate the strontium, if present, by means of sulphuric acid, and in the filtrate test as usual for calcium. *Ztschr. anal. Chem., 29, 556–561.* J. F. G.

Reactions of Resorcin and Thymol. By H. Bornträger.

Resorcin and thymol both give red color reactions with nascent nitrous acid, the former blood red, the latter yellowish red.

In alcoholic solution both remain clear, but in water solution the thymol deposits yellowish red flakes. The thymol also produces an ethereal odor due to formation of thymol nitrite.

Another distinctive test is to place in a test tube about equal quantities of some dry nitrite, calcium sulphate and sodium bisulphate, moisten with water, add the liquid to be tested and heat the mixture. In presence of thymol the mixture becomes chrome red, while resorcin gives rise to a dark chrome green color and bright red drops in the upper part of the tube. The solution must be acid to develop the colors. (*Ztschr. anal. Chem.*, **29**, *572.*) J. F. G.

Estimation of Zinc in its Ores. By Delfo Coda.

In the customary method for estimating zinc in its ores considerable zinc is lost by being enclosed in the precipitated iron

* This method of separation is not new, as it has been used by the students from the laboratory of the Univ. of Michigan, for over ten years. See also "Qualitative Chemical Analysis," by Douglas & Prescott, 3d Ed., p. 242 J. F. G.

from which it is not totally removed by washing. To prevent this loss the author recommends ammonium sulphate.

Dissolve 2.5g zinc ore in 15 to 20 c.c. aqua regia, evaporate, add 15–20 c.c. H_2SO_4, heat until sulphuric acid vapors rise so as to ensure removal of Cl and NO. In presence of Cu, Cd., etc., dilute and precipitate by H_2S, filter and remove H_2S from filtrate by boiling. The filtrate containing Zn, Fe, Mn and alkalies; neutralize with ammonia, then add 40 c.c. ammonia (10%?), containing one-quarter ammonium carbonate. The iron is precipitated free from zinc. Cool, dilute to 500 c.c., filter through a dry filter and of the filtrate take portions of 100 c.c., dilute each to 250 c.c. This solution is ready for titration with sodium sulphide solution.

For comparison or standardizing dissolve a known weight of zinc (the quantity should be about that contained in .5 grm. of the zinc ore under examination) in 4 c.c. hydrochloric acid, dilute, make alkaline with 20 c.c. ammonia, dilute again to 250 c.c. For precipitation use a 2% solution of crystalized sodium sulphide, using sodium nitroprusside as an indicator of the end reaction. The several portions of 100 c. c. each serve for checks upon each other in the titration. (*Ztschr. anal. Chem.*, **29**, *266–271.*) J. F. G.

Examination of Alcoholic Liquors. By W. FRESENIUS.

A lengthy and valuable paper on the examination and appraising of alcoholic liquors. The article does not admit of a brief abstract, hence the readers are referred to the original. (*Ztschr. anal. Chem.*, **29**, *283–317.*) J. F. G.

Valuation of Zinc Dust. By G. KLEMP.

The author bases his method upon the reduction of iodic acid in alkaline solution. The comparative estimations with other methods gave very satisfactory results. Metallic iron and lead will always interfere more or less with oxidation and reduction methods.

Requirements:

A solution of 15.25 grms. KIO_3 in 300 c. c. of water, of which solution 3 c. c. are used for each 0.1 grm. zinc dust taken.

An alkaline solution containing either 300 grms. NaOH, or about 370 grms, KOH per litre, of which 10 c. c. are to be used for each 0.1 grm. zinc.

Of the finely divided and carefully mixed dust weigh out 0.5 to 1 grm. into a dry glass stoppered flask of about 200 c. c. capacity. Mix the required amounts of KOH and KIO_3 solutions (10 c. c. of the former, and 3 c. c. of the latter for each 0.1 grm. zinc taken) in a beaker, and after adding a few glass beads to the zinc in the flask, pour in the alkaline mixture, stopper securely, and agitate the contents of the flask for about five minutes. Cool before removing the stopper. * Remove the contents of the flask to one of 250 to 500 capacity, according to the quantity of zinc taken. Fill up to mark after cooling and contraction has taken place upon diluting the solution. Mix thoroughly and remove 100 c. c. to a suitable retort for distillation. It is essential that cork and rubber stoppers be avoided, hence, the ground stopper end of the retort must be carefully fitted to the receiver used. In the latter there are placed for 100 c. c. sol., when .5 grm. zinc was taken, 20 c. c. of a solution containing .4 grm. KI. Through a funnel dilute sulphuric acid is added to the contents in the retort and the latter immediately connected with a CO_2 apparatus. Heat is now gradually applied to the retort until the contents boil actively.

Distillation is usually completed in about 20 minutes. It is well to protect the receiver with a safety tube containing KI sol. so as to prevent loss of I, which may be carried over by the CO_2 current. A suitable apparatus is that of Topf (*Ztschr. anal. Chem.*, **26,** *293*). The liberated iodine is estimated volumetrically by means of sod. hyposulphite sol.

The reactions are based upon the equations :

$$15\ Zn + 30\ KOH = 15\ Zn(OK)_2 + 15H_2$$
$$5\ KIO_3 + 15H_2 = 5\ KI + 15\ H_2O$$
$$KIO_3 + 5\ KI + 3H_2SO_4 = 3K_2SO_4 + 3H_2O + 6I$$

Whence 5 Zn = 2I or 0.1 grm. Zn = 0.407,799 grm. I (*Ztschr. anal. Chem.*, **29,** *253–266*) J. F. G.

*It is better at once to place the zinc in a flask of suitable size so as to avoid the transfer. J. F. G.

Abstracts of American Patents Relating to Chemistry.

(*From the U. S. Patent Office Gazette.*)

Issued December 2, 1890.

441,803.—Preparing acidulated oil. H. Nordlinger.

A process of obtaining a homogeneous mixture of fatty oil and vinegar free from water and other impurities, consisting in first mixing the oil and vinegar, next adding a salt soluble in water to throw down the water and other impurities from the oil and vinegar, and afterwards separating by decantation the acidulated oil from the impurities and saline liquid.

441,853.—Manufacture of varnish. B. Piffard.

A varnish consisting of colophonate of lead, wax or waxy matter, and a solvent.

441,941.—Gas producer. J. W. Culmer.

441,945.—Red dye. C. Dreyfus.

Prepared by combining diazotized dehydrothioparatoluidine sulphonic acid with beta naphthol.

442,016.—Process of treating ore containing lead, silver and zinc. C. L. Coffin.

Issued December 9, 1890.

442,094.—Sulpho compound. E. A. Baumann.

A compound having the formula $C_9S_2O_4H_{20}$, melting at 87° C., crystallizing in silvery scales, difficultly soluble in cold water, easily in hot water, ether, alcohol and benzine.

442,109.—Process of making chromates. W. J. A. Donald.

The process consists in calcining the insoluble residuum, resulting from the ordinary manufacture of chromates, pulverizing it, and then mixing this powder with chrome ore, lime, and a solution of the salt to be produced.

442,164.—Quick match. L. Bäärnhielm.

Consists of a core of twisted cotton yarn impregnated with a solution of potassium chlorate, to which is added potassium ferrocyanide, and coated with collodion and directly surrounded with an envelope of asphalt, dissolved in linseed oil or another fat oil, to which likewise is added some salt of manganese protoxide, talc and sulphur.

442,195.—Paint. J. T. McKim.

Consists of calcareous ochre, iron ore paint, litharge, argol, japan, coal tar and benzine.

442,245.—Insect powder. G. Calor.

A mixture of zinc dust and magnesium carbonate.

442,297.—Process of bleaching hair. F. G. Wiselogel.

The hair is first thoroughly washed in cold water, and then treated in a bath of hot water containing a small quantity of lime. It is finally placed in a drying apparatus, and a strong current of dry sulphurated air passed through, until it is dry.

442,369.—Blue-black dye. Leo Gans.

Derived from amidonaphtholmonosulphonic acid and tetrazodiphenyl or homologous compounds, soluble in water and nearly insoluble in alcohol, turning blue in sulphuric acid.

442,397.—Filter. H. Roeske.

442,450.—Process of making iron prints by photography. C. B. McBlair.

The material is sensitized with a solution of ferric chloride, tartaric acid, and ferrous sulphate, and after exposure is developed with gallic acid.

442,463.—Composition for fixing ink impressions. D. C. Simpson.

A mixture of plumbic acetate, potassium chlorate and cupric acetate, for treating paper and the like to render writings or markings indelible.

442,490.—Process of making fertilizer from sewage sludge. C. H. Morgan.

442,493.—Apparatus for the manufacture of wood and oil gas. G. Ramsdell.

442,593.—Food product. A. W. Rehnstrom.

Consists of dry and roasted whey and milk.

(*Issued December 16, 1890.*)

442,600.—Apparatus for utilizing waste gaseous products. E. Biedermann and E. W. Harvey.

442,601.—Apparatus for filtering water. J. H. Blessing.

442,602.—Water filtering apparatus. J. H. Blessing.

442,613.—Regenerative gas lamp. L. A. Cooper.

442,625.—Ammonia still. F. Kaiser.

442,628.—Apparatus for dyeing hides. J. Kristen.

442,661.—Process for desilverizing lead by electrolysis. T. D. Bottome.

Argentiferous lead is subjected to electrolysis, while immersed in an electrolyte composed of ammonium salts kept saturated with carbon dioxide.

442,680.—Blue dye. M. Hoffmann and A. Weinberg.

It forms a dark greenish or crystalline powder; dissolves easily in water

with a blue color; is soluble in alcohol and insoluble in benzine or ether; dissolves in strong sulphuric acid with a brown shade.

442,684.—Tanning process. A. F. Krueger.

The hides are subjected to the action of alum, salt, and cutch, and then to the action of bark liquor.

442,693.—Vapor burner. E. G. Mummery.

442,741.—Method of manufacturing highly sensitive isochromatic gelatine plates. H. W. Vogel.

Consists of a base, a sensitive film, and a compound of silver, and a dye or dyes held by the film.

442,802.—Process of refining hydrocarbon oils. J. Gardner and J. F. Harris.

442,867.—Preservative compound for brick, stone, etc. L. B. Drake.

Consists of boiled linseed oil, water, gasoline, sal soda, sugar of lead, and silicate of soda.

442,896.—Oil filter or separator. J. Johnson.

442,943.—Manufacture of white lead. G. Bischof.

White lead is prepared from the lead oxides of commerce by reducing them to suboxide, then subjecting the latter, mixed with water, to the action of the air, and finally subjecting the resulting product in admixture with water, sugar and acetic acid or an acetate to the action of carbon dioxide.

442,962.—Hydrometer. A. Eichhorn.

A hydrometer having a picnometer suspended from the float.

443,026.—Dye. F. C. Weiss.

The materials to be dyed are treated with anacardine extract, potassium birchromate and indigo.

443,035.—Dynamite. W. D. Borland.

A liquid nitro explosive absorbed by charred or carbonized cork.

(*Issued December 23, 1890.*)

443,105.—Method of preparing nitro-cellulose. G. M. Mowbray.

The process consists of three steps: first, a preliminary impregnation of the cellulose material, whether simply fibrous, felted, or textile, by crystallizing a salt, preferably sodium nitrate, in the interstices of the cellulose material; second, immersing this dry saline impregnated cellulose material in a suitable bath of sulphuric and nitric acids; and, third, removing the nitro-cellulose from the saline acid bath, washing out the adherent acids, and drying the nitro-cellulose.

443,116.—White safety paper. A. Schlumberger.

The paper is impregnated with a resinated ferrous salt, a resin compound of plumbic ferrocyanide, and a resin compound of manganese ferrocyanide, in combination with a salt of molybdenum and a resin compound of zinc sulphide.

443,122.—Process of manufacturing gas. L. Stevens.

443,153.—Apparatus for the manufacture of coal gas. J. J. Thomas.

443,186.—Purifying water for boilers and salt making. J. L. Alberger.

443,190.—Apparatus for the manufacture of fermented liquids. H. Goetter.

443,225.—Process of preparing hydrocarbon and other oils for burning. J. H. Macy.

443,238.—Process of treating wood and fibre. W. A. Horrall.

The plants are subjected to the action of a liquid composed of water, alcohol, sugar and an acid, until fermentation subsides and disintegration is complete.

443,250.—Artificial stone. G. Buchner.

Consists of sawdust, caseine, glycerine, water glass, slaked lime, magnesia, and oil.

443,328.—Apparatus for distilling hydrocarbons. T. McGowan.

443,361.—Composition for coloring and tinting. F. W. Fewins.

Consists of water, whiting or other water color mineral, soluble glass, boiled linseed oil, and coloring matter.

443,375.—Process of marking textile fabrics. D. S. Oliphant.

A solution of potassium bichromate, mucilage and water is applied to the fabric, and after drying it is written upon with an ink consisting of aniline hydrochloride, water, mucilage and glycerine.

443,402.—Gallacetophenone. M. V. Nencki.

It is characterized by the following properties: It is a pale, yellowish crystalline substance soluble in hot water, from which it crystallizes on cooling; it is readily soluble in alcohol; in cold benzine it is practically insoluble, and only very slightly soluble in boiling benzine, but soluble in alkalies, giving pale yellow solutions, which soon turn brown on exposure to air; it melts at about 168°C., and on analysis gives figures corresponding to $C_8H^8O_4$.

443,408.—Yellow-red dye. C. Schraube.

A derivative of rosinduline sulpho acid, which appears as a reddish brown powder, readily soluble in both hot and cold water, giving a yellowish red solution. It is soluble in boiling alcohol, but insoluble in benzene. Large quantities of caustic soda or saturated common salt precipitate it from its aqueous solution. It is soluble in concentrated sulphuric acid, but precipated by dilute acids.

443,422.—Paint. J. H. Baker.

Consists of whiting, glue, alum, plaster of paris, drier, white lead, linseed oil, and water.

443,464.—Process of manufacturing steel coated wire. F. Sedgwick.

The surface of a wire is converted into steel by drawing the wire through a steelifying bath or material and heating that portion of the wire which is in the act of passing through the bath or material by means of electricity.

(Issued December 30th, 1890.)

443,549.—Apparatus for refining loaf sugar in moulds. C. Steffen.

443,559.—Process of making fertilizer from tank water. H. T. Yaryan.

The tank water is evaporated to the desired density and passed through a dializer, by which deliquescent salts are removed, and finally evapor ated to dryness.

443,584.—Carburetor. E. D. Self.

443,629.—Manufacture of flowers of sulphur. E. F. White.

443,685.—Process of making alum cake. H. W. Shepard.

Consists in adding to sulphuric acid bauxite or other aluminous material in quantity sufficient to form a basic sulphate of alumina, adding to the hot pasty mass resulting an alkaline or alkaline earthy sulphide and mixing the same therewith in quantity sufficient to reduce the soluble iron in the mixture to the ferrous state, diluting the mass with water, separating the dissolved sulphate from the insoluble impurities of the mixture, and concentrating the solution to form the commercial aluminous cake.

443,757.—Process of reducing copper matte. J. E. Gaylord.

443,758.—Process of converting copper matte to copper. J. E. Gaylord.

443,761.—Process of purifying spent soap lyes. O. C. Hagemann.

To the spent lye is added an acid and an iron salt, such as ferric chloride, and the precipitate thus formed is removed. Then acid is again added, and chlorine, the liquor is heated and air blown through it, after which the precipitate is removed and the liquor neutralized.

443,907.—Extracting oil. J. W. Evans.

443,940.—Recovering fatty products. M. L. Griffin, E. S. Thayer and E. S. Buffum.

The process is for treating the residuum of scouring suds, etc., and consists in adding acid, mixing therewith a porous and granular substance in sufficient excess to retain its granular shape, and finally treating it with naphtha or carbon disulphide.

443,943.—Alloy. I. H. Johannes.

Consists of more than 15% of aluminium, and less than 85% by weight of tin, antimony and lead combined.

443,951.—Apparatus for generating illuminating water gas. J. D. Averell.

443,979.—Preparing chocolate. V. Tobias and H. Fischer.

Liquid chocolate is prepared by heating whey or poor milk to the boiling point, then adding a mixture of cocoa and sugar, then cooling the mixture and removing the cocoa butter. W. R.

EXCHANGES RECEIVED BY THE AMERICAN CHEMICAL SOCIETY

(To be found in the Library).

UNITED STATES. American Chemical Journal.
American Druggist.
American Gas Light Journal.
American Journal of Pharmacy.
American Manufacturer and Iron World.
American Naturalist.
Annals of the New York Academy of Sciences.
Anthony's Photographic Bulletin.
Bulletin of the American Museum of Natural History.
Bulletin of the Connecticut Agricultural Experiment Station.
Bulletin of the Masschusetts State Agricultural Experiment Station.
Circulars of Information, Bureau of Education, Washington, D. C.
Deutsch-Amerikanische Apotheker-Zeitung.
Druggists' Circular.
Engineering and Mining Journal.
Ephemeris (Sqibb).
Journal of Analytical Chemistry.
Journal of the Franklin Institute.
Manufacturer and Builder.
Manufacturers Review and Industrial Record.
Medico-Legal Journal.
New Idea.
New York Medical Journal.
Oil, Paint and Drug Reporter.
Pharmaceutical Record.
Popular Science Monthly.
Proceedings of the Academy of Natural Sciences, Philadelphia.
Proceedings of the American Academy of Arts and Sciences, Boston.
Proceedings of the American Philosophical Society, Philadelphia.

	Reports of the Geological Survey of Pennsylvania.
	Reports of the Storr's School Agricultural Experiment Station.
	School of Mines Quarterly.
	Technology Quarterly.
	Textile Colorist.
	Transactions of the American Institute of Electrical Engineers.
	Transactions of the American Institute of Mining Engineers.
	Transactions of the New York Academy of Sciences.
CANADA.	Proceedings of the Canadian Institute.
	Reports of the Geological Survey of Canada.
CHILI.	Verhandlungen des deutsch-wissenschaftlichen Vereins zu Santiago.
MEXICO.	Boletin del Ministerio de Fomento.
	Boletin Mensual.
	Informes y Documentos Relativos á Comercio, etc.
	Memorias y Revista de la Sociedad Cientifica.
PERU.	Boletin de Minas.
GREAT BRITAIN.	Analyst.
	Chemical News.
	Engineering.
	Industries.
	Invention.
	Iron.
	Journal of the Chemical Society.
	Journal of the Society of Arts.
	Journal of the Society of Chemical Industry.
	Oil and Colorman's Journal.
	Pharmaceutical Journal and Transactions.
	Sugar Cane.
	Transactions of the Laboratory Club.
FRANCE.	Annales des Mines.
	Bulletin de la Société Chimique de Paris.
	Bulletin de la Société Industrielle de Rouen.
	Moniteur de la Teinture.
	Moniteur Scientifique, Quesneville.
	Repertoire de Pharmacy.
GERMANY.	Archiv der Pharmacie.
	Bierbrauer.
	Bulletin de la Société Industrielle de Mulhouse.
	Gerber-Zeitung.
	Sitzungsberichte der K. B. Akademie der Wissenschaften zu Munchen.

HOLLAND.	Revue International des Falsifications.
AUSTRIA.	Allgemeine Oesterreichische Chemiker und Techniker Zeitung.
	Chemisch-Technischer Central-Anzeiger.
	Drogisten Zeitung.
	Jahrbuch de K. K. Geologischen Reichsanstalt.
	Oesterriche Zeitschrift für Berg-und Hüttenwesen.
ITALY.	Gazzetta Chimica Italiana.
RUSSIA.	Bulletin de l'Academie Imperiale des Sciences de St. Petersburg.
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ERRATA.

Page 25 ; 15th line from top for *azainine* read *azamine.*

Page 167 ; top—for *of* read *upon.*

Page 277 ; under title of article, insert By A. H. Sabin.

Page 368 ; for Dr. Edward P. *Haws* read *Harris.*

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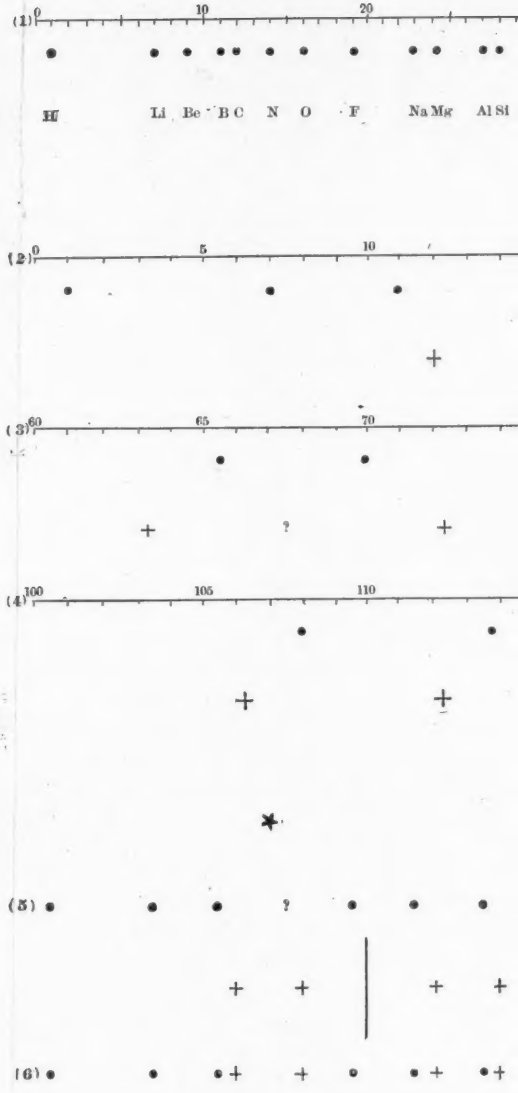
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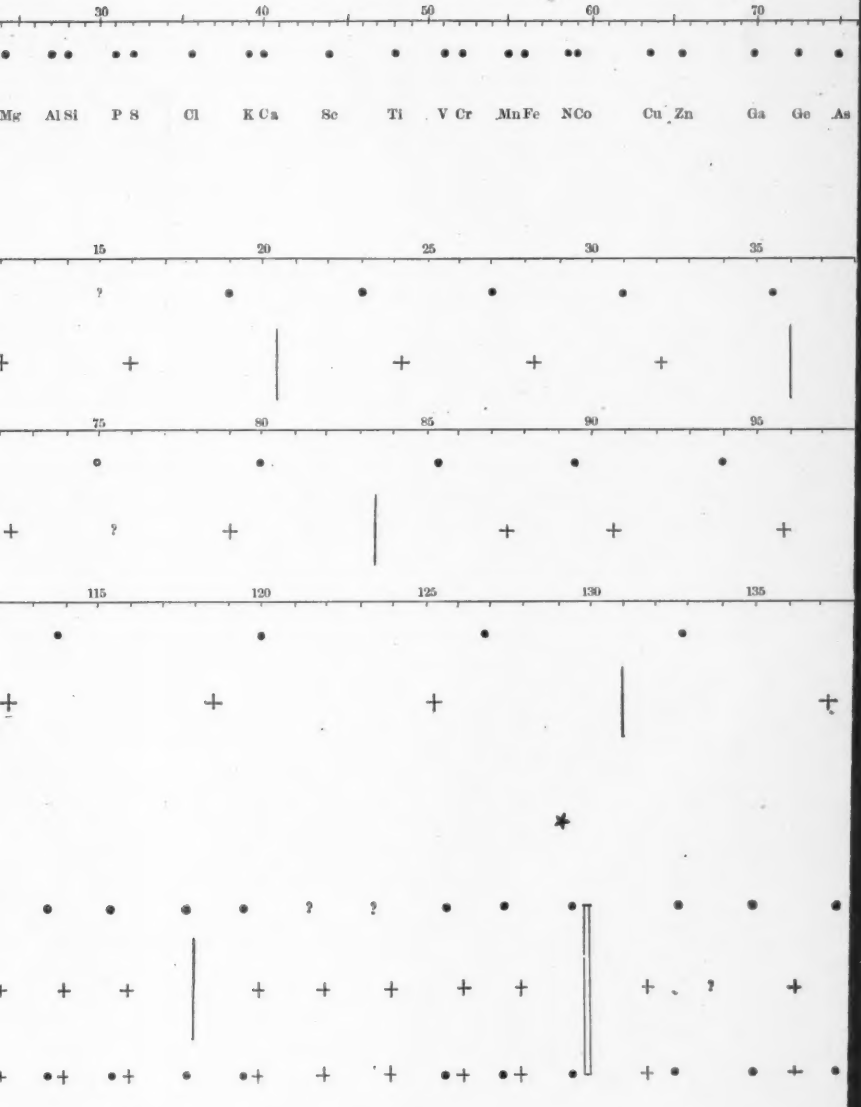
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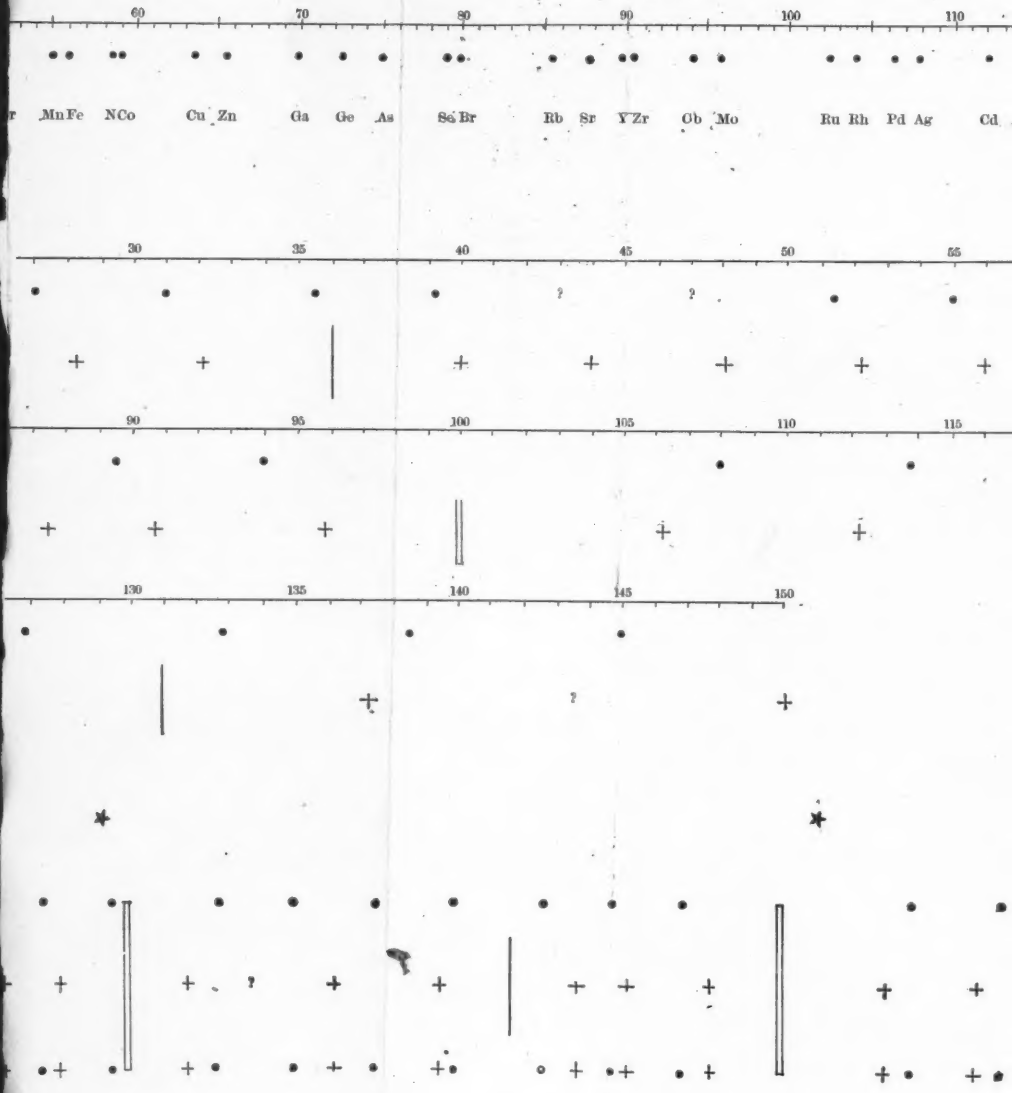

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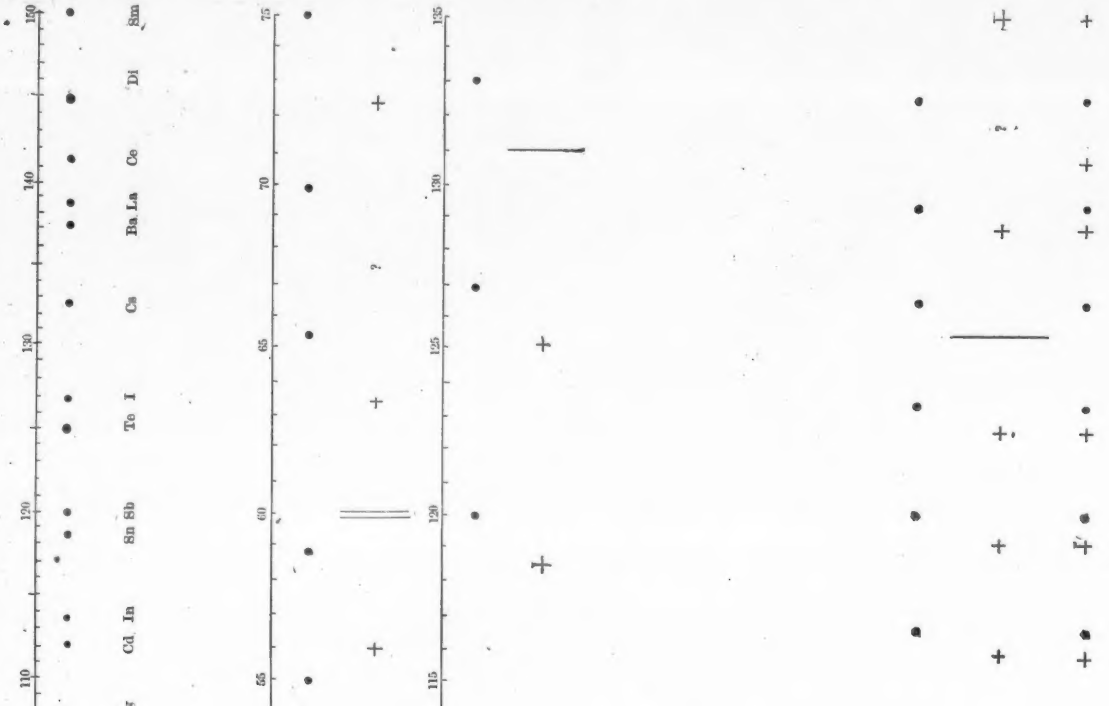

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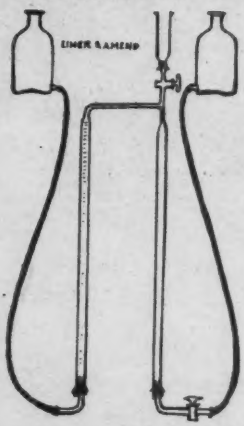

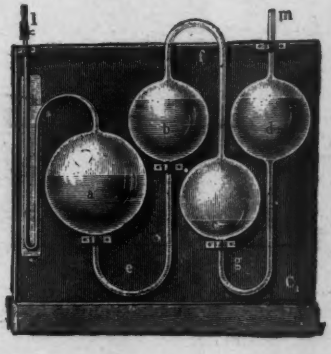

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